COMPOSITE WEB FOR MAKING RESEALABLE PACKAGES AND RECLOSABLE SEALS

This application is a continuation in part of copending application serial number 09/364,180 filed on 07/29/99 and is a divisional of copending application serial number 09/693,963 filed on 10/23/2000.

This invention relates generally to packaging systems, and more particularly to composite webs of packaging material for making flexible packages of the kind shown in my copending earlier application having an openable and reclosable interlocking seal which may be further provided with a center hinge and lateral side snap detents spaced along the length of the seal, the reclosable interlocking seal having male and female parts with the detents being formed in the female part and extending into the male part. The novel seal structure provides tactile and auditory snap indications of the state of the seal during opening and closing of the package. Also disclosed are methods and apparatus for making such packages and seals from a continuous composite web of flexible packaging film, the seals being formed during package formation at line speed.

BACKGROUND OF THE INVENTION

In the past, the methods of making reclosable flexible packages have usually involved either the extrusion of a two part zipper type locking structure along with the film extending longitudinally in the direction of film extrusion along the opposite edges of the film, or by heat sealing a separately made extruded zipper type locking structure to the package film. The first type of package formation results in packages having the reclosable feature in the consumer non-preferred position along the long edge of the package, while the second type of package formation results in packages which are expensive to make because of the need to inventory and store rolls of the separate zipper structure for attachment to the packaging film and the need to insure that the separately obtained packaging film and zipper are made of compatible materials. Consumer focus groups have disclosed dissatisfaction with both types of zipper structure for various reasons, such as user frustration because of difficulty in reclosing the zippers, and no feedback to the user that the zipper has in fact been engaged.

Shown and described in my earlier application is a resealable interlocking closure of the same general kind as shown and described in this application, but which does not utilize the composite web technology of the present invention, and does not include the improved features of the present invention.

SUMMARY OF THE INVENTION

The package and system according to the present invention utilize a novel composite packaging film structure comprising the packaging film with strips of formable plastic laminated to the film at package length intervals. The composite packaging film structure may be preformed and stored as roll stock material or may be concurrently made by a Sig Pack, Inc. Easy Snap^{tm} Laminator mounted atop or adjacent to the packaging apparatus to form the novel composite packaging film structure, which composite film is then fed into the packaging apparatus to form the finished package incorporating the novel reclosable seal formed in the film and strip composite. The laminator functions with both horizontal and vertical form/fill/seal wrapping machines and with overwrap packagers, and laminates various plastic strip materials to diverse heat seal packaging films.

The packaging films could be for example, polypropylene, polyethylene, polystyrene, polyvinylchloride, thermoplastic heat seal coated non-plastic films, and various film laminations of two to four layers, while the plastic strip could be formed of one to three layers. In some applications the strip could be a single thickness of polyvinylchloride (PVC) heat sealed to a PVC film at a temperature of about 230° F for 1/2 to 3/4 seconds, while in other applications the strip could be of two layers such as PVC plus a sealing layer, or three layers such as a center layer coated on opposite sides respectively with a sealing layer and a release layer to prevent the strip from self adhering during formation of the reclosable interlock seal. A commonly used packaging film is a four layer film consisting of two layers of polypropylene separated by a layer of low density polyethylene and having a heat seal layer of low density polyethylene coated on one face.

The invention is shown and described in conjunction with a modified vertical form, fill and seal packaging machine having a novel fill tube forming collar and novel package sealing press which latter also forms the novel resealable closure, the packaging machine being for example a Sig Pack, Inc. Eagle Infinity, Model 1524,

Packages made according to the invention incorporating the novel reclosable seal address the consumer complaints relating to prior art zipper seals by providing clear auditory and tactile indications of the closing of the reclosable seal by incorporation of snap detents, so that the consumer is assured that the package has been resealed even in the absence of visual package inspection.

Accordingly, it is a primary object of the invention to provide a novel composite packaging film structure comprising packaging film with strips of formable plastic laminated to the film at package length intervals.

An additional object of the invention is to provide a package having an openable and reclosable interlocking seal in which the bulk of the seal structure is provided by an added layer of strip material secured in a specific way to the novel composite packaging film at package length intervals.

A yet further object of the invention is to provide packages in which the reclosable interlocking seal is formed from the novel composite web packaging film having a heat sealable strip heat sealed to the packaging film.

A still further object of the invention is to provide packages in which the packages may be formed from a variety of packaging films such as polypropylene, polyethelene, polystyrene, polyvinylchloride, and various film laminates.

The foregoing and other objects of the invention will be more clearly understood from a reading of the following description in conjunction with an examination of the appended drawings, wherein:-

Figure 1 is a diagrammatic side view of the apparatus according to the invention showing the method and stages of package forming, filling, sealing, and severing, and showing the novel fill tube forming collar;

Figure 1A is a diagrammatic side view of a prior art conventional form, fill and seal packaging machine showing the standard type of fill tube forming collar;

Figure 2 is a diagrammatic front view of the apparatus seen in Figure 1;

Figure 3 is a plan view of a portion of one form of the novel composite film showing the packaging film and the placement of the attached strip suitable for making a package having an overlapped longitudinal seal;

Figure 4 is a diagrammatic cross section view through a package formed from the film of Figure 3 having a longitudinally extending overlap seal;

Figure 5 is a plan view of a portion of another form of the novel composite film showing the packaging film and the placement of the attached strip suitable for making a package having a longitudinal fin seal;

Figure 6 is a diagrammatic cross section view through a package formed from the film of Figure 5 having a longitudinally extending fin seal;

Figure 7 is a fragmentary enlarged view of a composite packaging film composed of a single layer film and a single layer strip;

Figure 8 is a fragmentary enlarged view of a composite packaging film composed of a multi-layer film and a multi-layer strip;

Figure 9 is an enlarged diagrammatic cross section through a bag being sealed and severed and through the novel sealing and reclosable seal forming press, shown with the press open before the sealing and seal forming step takes place;

Figures 9A through 9C show successive steps in the ends sealing, reclosable seal forming, and package severing process;

Figures 9D and 9E show two views of an alternative form of package having a top pull-open tab usable with a package top end seal formed with a thermoformable bond which can be pulled apart;

Figure 10 is an isometric view showing the forming dies which form the snap detents in the reclosable interlocking seal, with the reclosable seal shown in phantom outline;

Figure 11 is an enlarged fragmentary isometric view of the inner and outer parts of the reclosable seal in separated position, showing the snap detents in the sidewalls of the seal adjacent to the arrowhead interlock;

Figure 12 is an enlarged cross section through the reclosable seal shown in the phantom circle on Figure 9C showing the placement of the forming dies of Figure 10 and between the snap detents;

Figure 13 is an enlarged cross section through the reclosable seal and the snap detents which are formed between the teeth of the forming dies, as would be seen when viewed along line 13-13 on Figure 10;

Figure 14 is an isometric view of a package according to the invention showing showing the longitudinally extending overlap package seal uppermost, the package end seals, the integrally formed reclosable seal with the female portion uppermost and the seal side detent snaps;

Figure 15 shows the package of Figure 14 with the top end seal removed and the package opened;

Figure 16 is is an enlarged cross sectional diagrammatic showing of the upper end of a package including the novel reclosable interlocking seal according to the invention in its closed condition, and the package top heat seal spaced above the reclosable seal with an intervening length of unsecured package film;

Figure 17 is an enlarged cross sectional diagrammatic showing of the novel reclosable interlocking seal according to the invention in its closed condition with the package top heat seal shown in Figure 16 removed by cutting through the intervening length of unsecured package film; and

Figure 18 is an enlarged cross sectional diagrammatic showing of the novel reclosable interlocking seal according to the invention similar to Figure 17 but with the reclosable seal partly pulled open from the top;

In the several figures, like elements are denoted by like reference characters.

Considering first the side and front diagrammatic elevational views of Figures 1 and 2, there is seen a modified conventional vertical form-fill packaging apparatus designated generally as 20, and which could be for example a Sig Pack, Inc. Eagle Infinity, Model 1524, comprising a vertical cylindrical fill tube 21 surmounted by a conical feed horn 22 into which the material to be packaged is deposited. Disposed adjacent to the feed horn 22 at an angle of about fifteen degrees above the horizontal and turned downward around the feed horn 22 and fill tube 21 with a slight space therebetween is a fill tube forming collar 23, the purpose of which, together with the fill tube 21, is to form a composite web of packaging material 24 being fed over the forming collar 23 into a tube having a longitudinally extending seal 26 formed by the heat seal device 27. To avoid problems in reliably feeding the composite web packaging material, the angle of the fill tube forming collar is best kept to not less than horizontal but can be steeper than the fifteen degrees illustrated, although too high an elevation can cause film bunching and machinery headroom problems.

A pair of belt drives 28, by pulling downward on the tube 25, pull the web 24 downward off of the supply roll 29 or from the composite web forming apparatus 30 which laminates thermoformable strips 31 to the packaging material 32 to form the composite web of packaging material 24. The apparatus 30 may be a a Sig Pack, Inc. Easy Snap™ Laminator. The filled descending tube 25 passes through the bottom press 33 where it pauses for formation of the top seal 35 and the reclosable seal 36, severing of the completed package 34 from the above lying tube, and formation of a bottom seal 37 of the next descending package. The completed package 34 is carried away by the conveyor 38.

The apparatus of Figures 1 and 2 departs from conventional vertical form-fill apparatus in two particulars. First, as shown in Figure 1A, prior art conventional apparatus has the front edge of its fill tube forming collar 23' disposed substantially orthogonally to the surface of the conical feed horn 22, and this conventional orientation causes the thermoformable strips 31 to be torn off of the web of packaging film 32. This problem was solved in the apparatus according to the invention by reorienting the forming collar 23 as shown and providing a leading edge tack to the strips 31, as will become clear from Figures 3 and 4 to be next described. The second difference is the inclusion of the novel bottom press 33 which forms the reclosable seal, to be subsequently described.

Considering now Figures 3 and 5, there is seen in both, the packaging film material 32 and a thermoformable strip 31 secured to the film 32 substantially

continuously along the strip trailing edge 39 by heat seals 40, along the strip ends 41 as at 42, and by a short tack 43 at the center of the strip leading edge 44 to insure that the leading edge is against the packaging film as the composite web passes into the space between the feed horn 22 and forming collar 23 to prevent tearing off the strip from the film. The only difference between Figures 3 and 5 is that, in Figure 3 one end of the strip 31 is congruent with one edge 45 of the packaging film material 32 and the other end of the strip is spaced inward from the other edge 46 of the packaging film material 32 to form a side margin 47, while in Figure 5 both ends 41 of the strip are spaced inward from the edges 45 and 46 of the packaging film material 32 to form a pair of opposite side margins 48. The strips 31 are also provided with apertures 49 through the strips which in the completed package act as a weakened region allowing a hinge fold to occur when the package is opened. Another hinge is provided in the completed package opposite the first hinge by the substantially abutting apposed ends 41 of the strip 31, as seen in Figures 4 and 6. Figures 4 and 6 respectively show an overlap longitudinal package seal 26 as seen in Figure 2 formed by the side margin 47 of Figure 3, and a fin seal formed by the two side margins 48 of Figure 5 which may be made by other vertical form-fill machines.

Figure 7 illustrates a single layer strip 31 heat sealed to a single layer packaging film 32 in which typically the strip could be 3 to 15 mil polyvinylchloride and the film could be 1.5 to 4 mil polyvinylchloride. Figure 8 illustrates a three layer strip 31' sealed to a four layer packaging film 32'. The strip 31'could typically have a thermoformable plastic center layer 50 of 3 to 15 mil thickness, a heat seal layer 51 of 0.5 to 3 mil thickness, and a release layer 52 of 3 to 50 microns thickness. The release layer is sometimes needed to prevent the engaged faces of the folded strip from fusing together when the reclosable seal is formed in the manner subsequently to be described. The commonly used four layer film 32' is composed of two layers of polypropylene 53 separated by a layer 54 of low density polyethylene and having a heat seal layer 55 of low density polyethylene. Two layer strips and two and three layer films can also be used.

Turning now to Figures 9 through 9C which illustrate the formation of the package end seals and reclosable seal, there is seen in Figure 9 a package 34 which has been filled with product 56 while descending, and has stopped at a position where the upper part of the package is within the bottom press 33 just prior to completion by the formation of the top seal and reclosable seal. The package 34 is stopped so that the thermoformable strip 31 is positioned between the reclosable seal forming horizontally reciprocable heated female die 58 and the two part heated male die 57,

with an above-lying length 59 of the tube 25 positioned below the composite heated dies 60 and 61 and the package severing cutter 62 and anvil 63. The female die 58 is provided with a forming recess 68, and the male die is provided with a forming wedge 69 carried by the male die part 57B and shaped complementally to the female die recess 68. The composite dies 60 and 61 consist of a pair of dies 64 which form the top seal 35 of the package 34 being completed, and a pair of above-lying dies 65 which form the bottom seal 37 of the next package to descend. Disposed above and below the forming recess 68 of female die 58 are a pair of heated reclosable seal detent forming toothed dies 66 reciprocable with the female die 58 and pivotable toward one another on pivots 67.

Figure 9A shows the reclosable seal forming heated dies 57 and 58 moved toward one another and into engagement, heat forming the package film 32 and thermoformable strip 31 into the recess of the female die 58 to form the point of the arrowhead shaped reclosable seal. For clarity, the strip 31 is not shown in Figures 9A through 9C, but its location is seen clearly from Figures 9 and 11 to 13. At the same time, the heated dies 60 and 61 heat seal the tube 25 entirely widthwise for a vertical interval 70 and define the unsecured interval 59 between the bottom of the top seal 35 and the top of the reclosable seal 36, the portion of the seal 70 heated by the dies 64 becoming the package top seal 35, and the portion of the seal 70 heated by the dies 65 becoming the bottom seal 37 of the next descending package when the seal 70 is subsequently severed widthwise by the cutter 62.

The next step is a hybrid between Figures 9A and 9B in which the conditions are as shown in Figure 9A except that the detent forming dies 66 have pivoted inward and closed sufficiently to begin formation of the inwardly sloping bottom surfaces 72 of the arrowhead shaped interlock, but not sufficiently to clamp the male die forming wedge 69.

Figure 9B shows the immediately following condition in which the cutter 62 has moved laterally to sever the heat seal 70 against the anvil 63 and separate the package 34 from the above-lying tube 25. At the same time, male die part 57B carrying the wedge 69 partially retracts from the recess 68 of female die 58 and from between the teeth 71 of the dies 66, and the dies 66 pivot further inward driving the detent forming die teeth 71 toward one another to their maximum closed position, the teeth 71 pinching the packaging film 32 and thermoformable strip 31 therebetween to form the film and strip into the female die recess to continue forming the inwardly sloping bottom surfaces 72 of the arrowhead shaped reclosable seal 36, and forming the snap detents 73 best seen in Figures 11 and 13. The female die 58 is then moved

somewhat left toward the dies 66 to set the arrowhead shape between itself and the facing surfaces of teeth 71 of detent forming dies 66. The detents 73 are formed because as the softened thermoformable material of the film and strip are compressed between the teeth 71 the only direction that the compressed material can move is laterally into the spaces between the teeth 71, and then bulge outward between the teeth, forming the detents 73.

Figure 9C shows the male and female dies 57 and 58 outwardly retracted with the female die laterally carrying the package 34 held within it by the unopened detent forming dies 66, and the package end seal dies 60 and 61 and the cutter 62 have been retracted. The dies 66 remain engaged for a short time to complete setting of the detents, after which they open and release the completed package which drops to the conveyor 38 as shown in Figure1, and the sequence commencing with Figure 9 is repeated. Sequencing and timing controls and drives for the sequential movements of the various dies is provided by standard commercially available components.

A variation 34' of the package 34 is shown in Figures 9D and 9E in which it is seen that a flap or tab 74 extends centrally above the top heat seal 35', and that a cut-out 74' corresponding in shape to the tab 74 is located just below the bottom heat seal 37', with flanking flaps or tabs 75 disposed at both sides of the cut-out 74'. This configuration is readily achievable by vertically upwardly shifting the heat seal die 65 to provide an interval between it and the die 64, and configuring the cutter 62 to provide the cut-out pattern for the tabs 74 and 75. While this uses more package film, if a pull-apart heat seal material is provided at 35', the unsecured parts of the tab 74 can be grasped and used to pull open the top of the package.

Figures 10 through 13 show in greater detail the detent forming toothed dies 66 and the structure of the reclosable seal 36. Figure 10 shows more clearly the relationship between the dies and the reclosable seal, and shows the shorter die teeth 76 in the central region of the die corresponding to the region of the overlap longitudinal package seal 26 formed by the film margin 47, as best shown in Figure 11. Figure 11 also shows more clearly the snap detents 73 which are formed in the seal male part 36A and female part 36B by an outward bulging of the thermoformable material between adjacent teeth 71 of the dies 66 when the dies close. The heat softened material between the apposed die teeth is compressed and can only move laterally, but such movement causes the outward bulging of the material which forms the detents since material is moving from oppsite sides into the same space between the adjacent die teeth and can not move inward. This is also shown in Figure 12 in which the detents 73 are shown behind the die teeth 71. Figure 13 is a section taken

through the detents and shows the interfitted arrangement.

Figure 14 shows a completed package about to be opened by cutting off the top heat seal 35 with scissors 77, and Figure 15 shows the package with the top heat seal removed and pulled open, the bag remaining open because of the hinging folds 78 and 79. The hinge 78 results from the weakening produced by the strip 31 aperture 49 which is formed into the relatively rigid male part 36A of the reclosable seal 36, while the hinge 79 is formed at the abutment of the ends of the strip 31 located in the female part 36 B. The package is simply closed by inward directed finger pressure on the outside of the hinges 78 and 79 which causes the package sides to snap to each other, and by then applying finger pressure to press the the male and female parts 36A and 36B together so that the snap detents interlock.

Figures 16 to 18 show the upper end of a package 34 in enlarged diagrammatic cross section to illustrate the opening of the package. As shown in Figure 16, the top seal is removed by cutting below it to provide the free top tabs of packaging film 32 shown in Figures 17 and 18. These top tabs are pulled away from each other as shown in Figure 18 to open the female part 36B of the reclosable sealand disengage it from the inner male part 36A. The opening leverage is materially increased because the strip 31 is sealed to the film 32 by the trailing edge heat seal 40 and the opening pull is transmitted through the strip 31. Conversely, inadvertent opening of the package from the body side of the package is discriminated against because the strip 31 is unsecured to the package film 32 at its leading edge 44 inside the package and there is no reinforcement of pull on the film by the strip.

Having now described the invention in connection with particularly illustrated embodiments thereof, it will be understood that modifications and variations of the invention may now occur from time to time to those normally skilled in the art without departing from the essential scope or spirit of the invention, and accordingly it is intended to claim the invention both broadly and specifically as indicated in the appended claims.